



## **CABY Integrated Regional Water Management Group Proposition 84 2015 IRWM Round 3 Grant Solicitation**

### **Attachment 2: Project Justification**

Attached is the following:

- Project Summary (Table 4)
- Regional Map

Also attached for each project

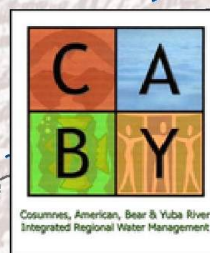
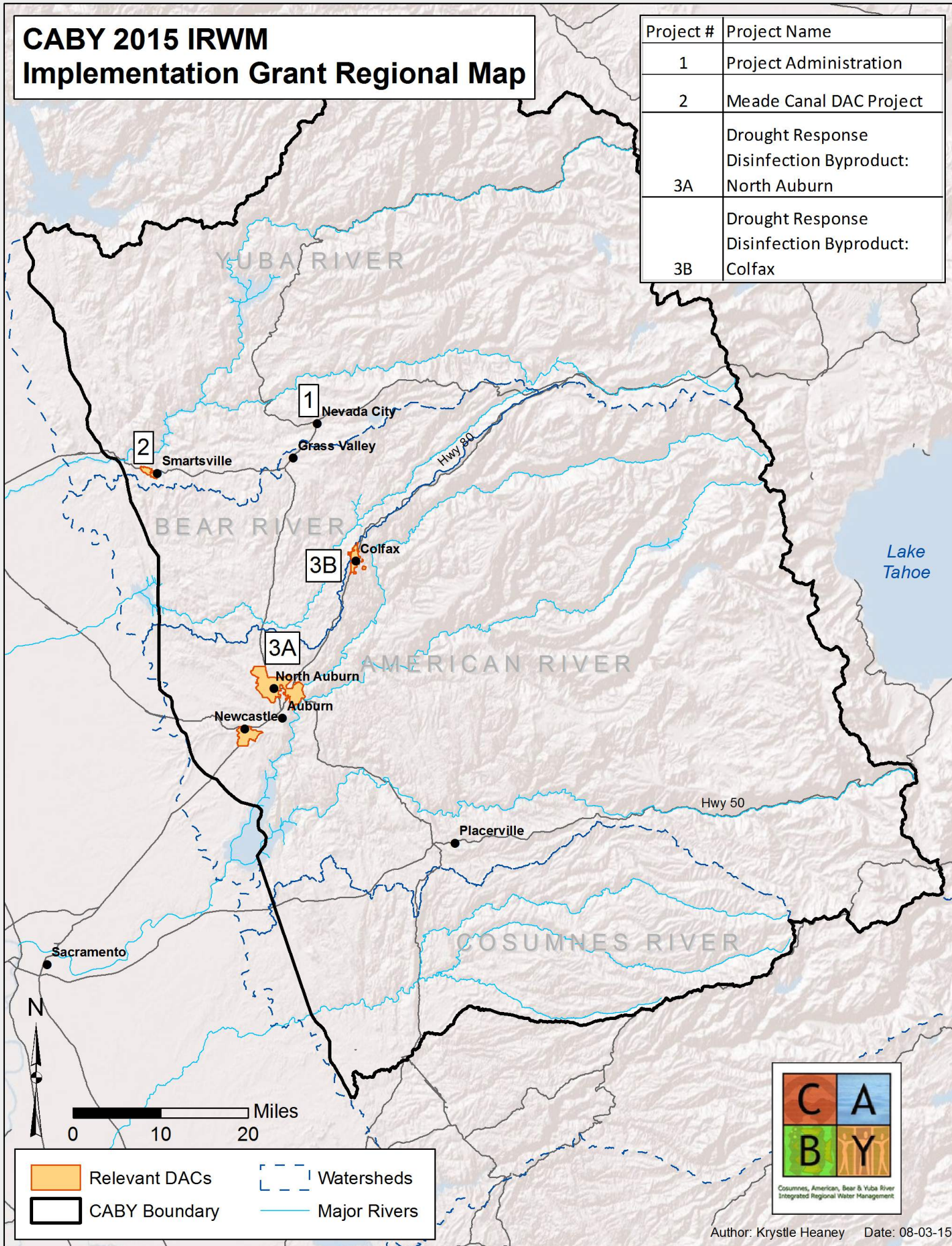
- Project Description
- Project Map
- Project Physical Benefits (Table 5)
- Technical Analysis of Physical Benefits Claimed
- Direct Water-Related Benefits to a DAC
- Project Performance Monitoring Plan (Table 6)
- Cost Effectiveness Analysis (Table 7)

Table 4 – 2015 IRWM Grant Solicitation Project Summary Table

IRWM Project Element		NID: Meade Canal DAC Project	PCWA: Drought Response Disinfection By-Product Reduction Project
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management		
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands		
IR.4	Non-point source pollution reduction, management, and monitoring	X	
IR.5	Groundwater recharge and management projects		
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users		
IR.7	Water banking, exchange, reclamation, and improvement of water quality		
IR.8	Planning and implementation of multipurpose flood management programs		
IR.9	Watershed protection and management		
IR.10	Drinking water treatment and distribution	X	X
IR.11	Ecosystem and fisheries restoration and protection		

# CABY 2015 IRWM Implementation Grant Regional Map

Project #	Project Name
1	Project Administration
2	Meade Canal DAC Project
3A	Drought Response Disinfection Byproduct: North Auburn
3B	Drought Response Disinfection Byproduct: Colfax





## **PROJECT 2: MEADE CANAL DAC PROJECT: Nevada Irrigation District**

### **PROJECT DESCRIPTION**

3,000 linear feet of earthen canal encased in a ductile iron pipeline to reduce water losses and increase water quality to Smartsville Water Treatment Plant.

### **Additional Project Description Info:**

NID has 425 miles of canals and flumes that deliver water to seven water treatment plants and over 30,000 customers. Raw water is also delivered to over 47,000 accounts that use the water for outdoor irrigation, stock ponds, ponds and commercial agriculture.

The problem of open unlined ditches was recognized in the CA Water Plan Update 2009<sup>1</sup> which recommended “lining and piping” to control seepage from ditches and canals as an Efficient Water Management Practice (EWMP), while the CA Water Plan Update 2013<sup>2</sup> recognizes that “open ditches and flumes are prone to seepage and to damage from forest fires and subsequent sedimentation and debris flows,” but that “Historically, rural county water purveyors have been unable to repair and replace their aging infrastructure”.

Along with other water agencies in the CABY Region, NID has identified canal lining and/or encasement as a priority measure to reduce water losses from seepage, improving efficiency and water quality. However, despite an ongoing program to prioritize and line many canals, many of NID’s canals are still earth-lined due to the prohibitive costs.

NID prioritizes canal improvements on an annual basis and has prioritized the encasement of 3,000 linear feet of the Meade canal as an urgently needed improvement. The Meade canal is typical of many earthen canals in the CABY region. The canal is a lateral canal of the longer China-Union Canal and directly feeds the water treatment plant of the Disadvantaged Community of Smartsville. Estimated annual water losses are 25 acre-feet per year.

Water quality is also a problem. The canal runs through pastureland and on a site visit on 6/23/15 NID staff chased away two calves, which were wading in the canal. The project will improve water quality by completely enclosing the canal thereby reducing contamination from grazing animals. The project will also eliminate the problem of bank erosion, thereby reducing sedimentation and also eliminating algae growth.

### **The Primary Benefits of this Project include:**

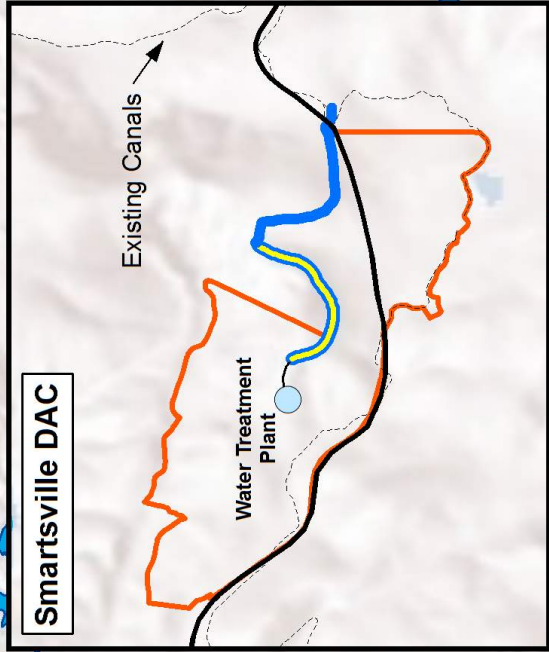
1. Improved regulatory compliance and drinking water quality.
2. Conserved water supply (25 acre feet reduction in water loss per year).

The work anticipated for the project includes the following:

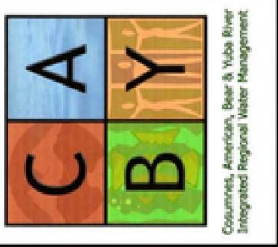
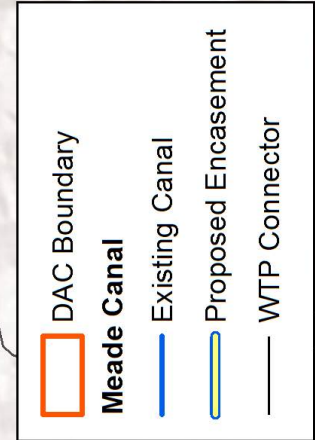
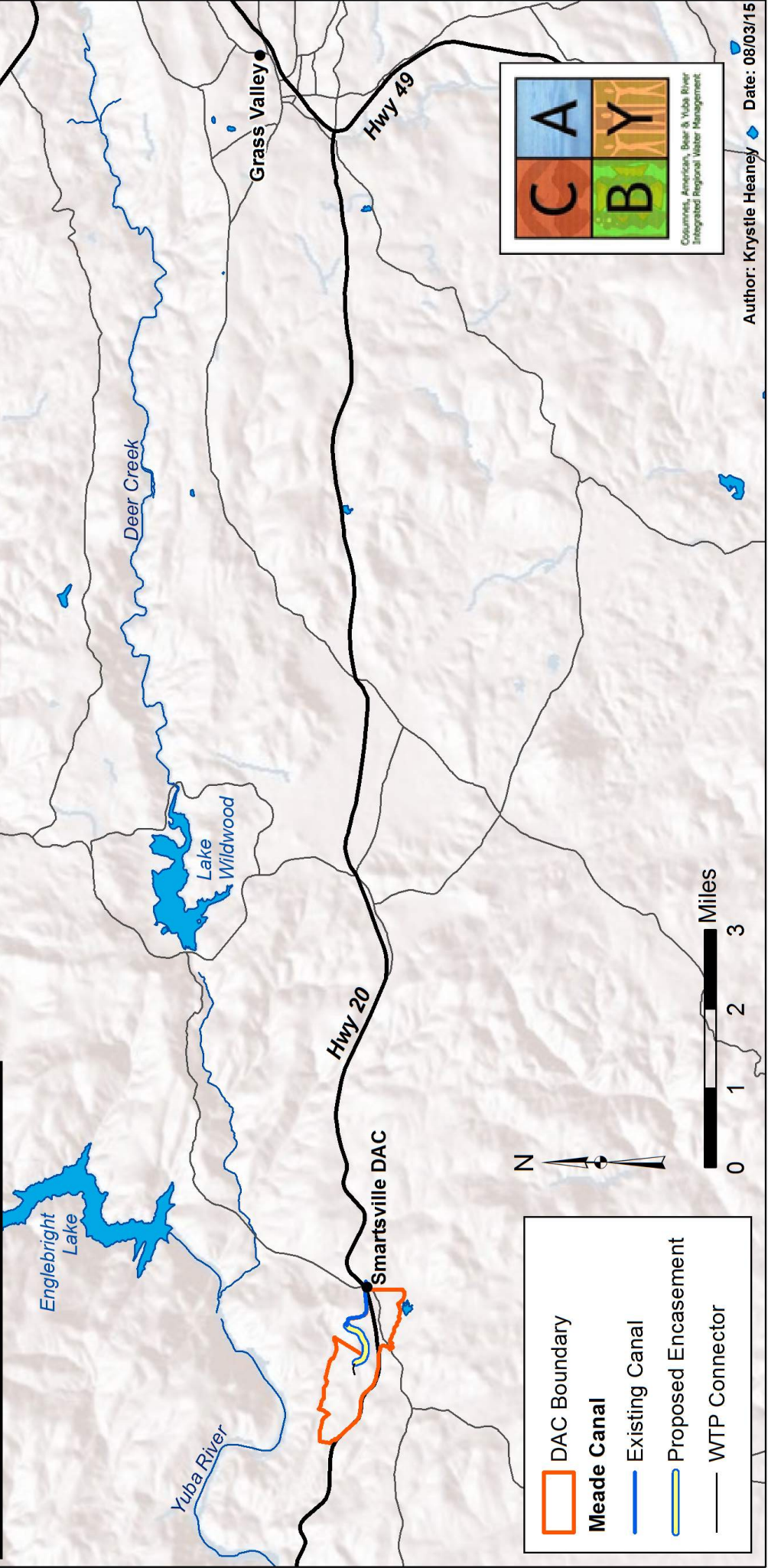
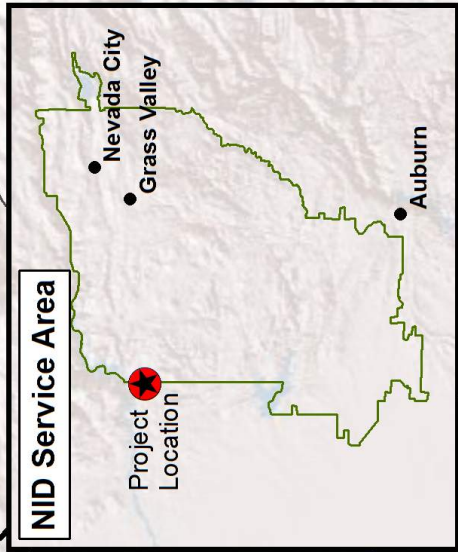
1. Mobilization of equipment, crew and materials.
2. Establishing access to Meade canal.
3. Dewatering of Meade canal.
4. Installation of pipe and erosion control features (as needed).
5. Restoring disturbed surfaces.
6. De-mobilizing.

<sup>1</sup> State of California Natural Resources Agency, Department of Water Resources. 2009. California Water Plan Update 2009

<sup>2</sup> State of California Natural Resources Agency, Department of Water Resources. 2013. California Water Plan Update 2013 Investing in Innovation and Infrastructure. Volume 2 Regional Reports: Mountain Counties. Page MC-67.



**Project 2: Meade Canal DAC Project**  
**Nevada Irrigation District Attachment 2:**  
**CABY 2015 IRWM Implementation Grant**



**PROJECT PHYSICAL BENEFITS**

The project has the following physically quantifiable benefits:

1. Improved regulatory compliance and drinking water quality (primary benefit) – see Table 5.1
2. Water Supply saved (secondary benefit) – see Table 5.2

The improved drinking water quality specifically refers to the reduced level of TOCs as a result of decreased contaminate load from soil erosion, plant and animal matter, and algae formation in response to piping an unlined earthen canal. The conserved water results from the reduction of water seepage and evaporation currently experienced with an unlined open canal.

<b>Table 5.1 - Annual Project Physical Benefits</b>			
<b>Project Name:</b> Meade Canal DAC Project			
<b>Type of Benefit Claimed:</b> Improved Water Quality, reduction in Total Organic Carbon			
<b>Measure of Benefit Claimed (Name of Units):</b> Milligrams per Liter (mg/L)			
<b>Additional Information about this Measure:</b>			
(a)	(b)	(c)	(d)
<b>Physical Benefits</b>			
<b>Year</b>	<b>Without Project</b>	<b>With Project</b>	<b>Change Resulting from Project (b) – (c)</b>
<b>2015 (and beyond)</b>	2.7 mg/L	2.0 mg/L	0.7 mg/L
<b>Comments:</b> PCWA & NID 2012 Yuba/Bear River Watershed Sanitary Survey 2012 Update (pages ES-6, 3-20, 3-27, 4-1, 4-12, 4-38-41, 5-1, 5-67-75).			
<b>Table 5.2 - Annual Project Physical Benefits</b>			
<b>Project Name:</b> Meade Canal DAC Project			
<b>Type of Benefit Claimed:</b> Amount of water supply produced, saved, or recycled (Primary)			
<b>Measure of Benefit Claimed (Name of Units):</b> Acre Feet Per Year (AF/Year)			
<b>Additional Information about this Measure:</b>			
(a)	(b)	(c)	(d)
<b>Physical Benefits</b>			
<b>Year</b>	<b>Without Project</b>	<b>With Project</b>	<b>Change Resulting from Project (b) – (c)</b>
<b>2015 (and beyond)</b>	0	25 AF/Year	25 AF/Year
<b>Comments:</b> Refs State of California Natural Resources Agency, Department of Water Resources. 2009. California Water Plan Update 2009 Integrated Water Management. Volume 2 Resource Management Strategies. Pages 2-8, 2-18. State of California Natural Resources Agency, Department of Water Resources. 2013. California Water Plan Update 2013 Investing in Innovation and Infrastructure. Volume 2 Regional Reports: Mountain Counties. Page MC-67. Kleinschmidt 2011 Nevada Irrigation District Raw Water Master Plan Update, Phase II (page 4-16, 6-11, 7-3) Kleinschmidt 2005 Nevada Irrigation District Raw Water Master Plan Update, Phase I Technical Analysis (page ES-18) PCWA 2005 Canal and Reservoir Feasibility Study Report Draft (pages 2 - 16) NRCS Soil Survey Report 2015. Custom Soil Resource Report for Yuba County, California (pages 8, 12) NID 2010. Nevada Irrigation District 2010 Urban Water Management Plan (page 6-2)			

## TECHNICAL ANALYSIS OF PHYSICAL BENEFITS CLAIMED

### ***1. Need for the Project***

Like many of the older water systems in the CABY Region, NID's canals were originally developed in the 1800's for the gold mining industry and then repurposed for agricultural and domestic uses. These older ditch systems have multiple problems: they are inefficient water delivery systems, susceptible to failure, and have high water conveyance losses. Open ditches also experience water quality problems and security issues while failures and overtopping result in erosion and damage to wildlife habitat.

NID and PCWA developed a comprehensive "Yuba/Bear River Watershed Sanitary Survey 2012 Update" in February of 2012<sup>3</sup>. The key concern identified in the survey was the Smartsville Water Treatment Plant (WTP) high TOC levels and E. coli contamination, which is due to a large portion of the water system that relies on open ditches to deliver water to WTPs and raw water customers.

The survey<sup>3</sup> recommended preparing Applications for funding of source water protection projects through the Cosumnes, American, Bear, and Yuba Rivers Integrated Regional Water Management Plan. This included activities that protect vulnerable sections of canal through canal lining and/or encasement. The basis for this recommendation comes from the fact that impacts of local activities are apparent in the source water quality. Implementing source water protection projects along the canals in close proximity to water treatment plants will be very likely to impact source water quality.

### ***2. Estimates of without-project conditions***

#### **Water Quality**

Total organic carbon (TOC) is a surrogate measure of disinfection by-products (DBP) precursor material in water. TOC levels in either source or treated water are used to determine treatment requirements in the Stage 1 Disinfectant/Disinfection By-Product Rule (D/DBPR).

All of the water treatment plants in the Sanitary Survey, except the Smartsville WTP, met the alternative compliance criterion for enhanced coagulation by having raw and treated water TOC levels less than 2 milligrams per liter (mg/L)<sup>3</sup>. Without measures to effectively decrease sources of organic precursors, such as the piping proposed, TOC levels will not meet compliance.

#### **Water Supply**

As estimated in the NID Raw Water Master Plan<sup>4</sup>, overall system loss is estimated to be approximately 15% of the delivery volume. In the near future, this will equate to approximately 30,000 acre-feet of volume per year<sup>5</sup>. However, some canals have substantially higher loss values, such as open and/or unlined canals. According to the NID 2011 Raw Water Master Plan<sup>4</sup>, the Bureau of Reclamation reports for preliminary purposes, losses in unlined earthen canals may be estimated to be one third of the total water carried and other references note total canal losses that vary from 13 to 55 percent.

<sup>3</sup> PCWA & NID 2012 Yuba/Bear River Watershed Sanitary Survey 2012 Update (pages ES-6, 3-20, 3-27,4-1, 4-12, 4-38-41, 5-1, 5-67-75).

<sup>4</sup> Kleinschmidt 2011 Nevada Irrigation District Raw Water Master Plan Update, Phase II (page 4-16, 6-11, 7-3)

<sup>5</sup> Kleinschmidt 2005 Nevada Irrigation District Raw Water Master Plan Update, Phase I Technical Analysis (page ES-18)

Using these sources and the PCWA Canal and Reservoir Feasibility Study<sup>6</sup>, NID has determined that water losses in their canals range from 10% to 20% of the water conveyed, and that the losses are due to seepage into the ground, operational losses (unaccounted water leaving canals through service boxes), and evaporation. NID estimates that over 4,000 acre feet of water a year is lost through leaks and percolation in its entire canal water delivery system. The Meade canal in particular was chosen as a priority for piping due to it being a critical water supply conveyance for the Disadvantaged Community of Smartsville and the current level of contamination.

### ***Description of methods used to estimate physical benefits.***

#### Water Quality Improvements

The Meade Canal is susceptible to contamination and failure, putting drinking water supplies at risk and resulting in erosion and water quality issues that increase the contaminate load that must be removed by the treatment process. Disinfection By-Products (DBPs) are formed when disinfectants added to water react with naturally occurring organic matter or other constituents, such as bromide. Since the Yuba and Bear Rivers do not have detectable levels of bromide, Total Organic Carbon (TOC) is the key precursor for DBPs. The most common DBPs are total trihalomethanes (TTHMs), which are suspected carcinogens. Other DBPs, including haloacetic acids (HAA5), are suspected mutagens and teratogens. Potential sources of these organic precursors are plant matter, animal matter, and soil, which can be contributed by general watershed runoff, urban runoff, agricultural runoff, recreation, grazing, and wastewater sources.

The Stage 1 Disinfectants/Disinfection Byproduct Rule (D/DBPR) requires varying levels of TOC removal if the source water TOC concentrations exceed 2 mg/L and a utility uses conventional filtration. TOC was a selected constituent for further evaluation in the Sanitation Study due to its importance in the formation of DBPs and also as a general indicator of organic contamination in water. TOC increases downstream for the WTPs using Deer Creek, including the Smartsville WTP; it has been suggested that this is due to localized potential contaminant sources, such as grazing<sup>3</sup>.

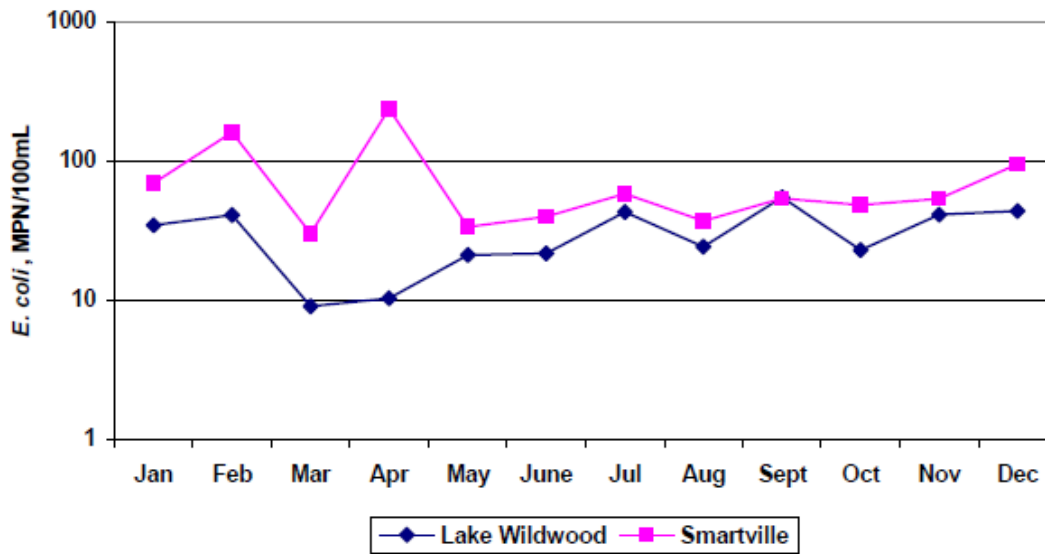
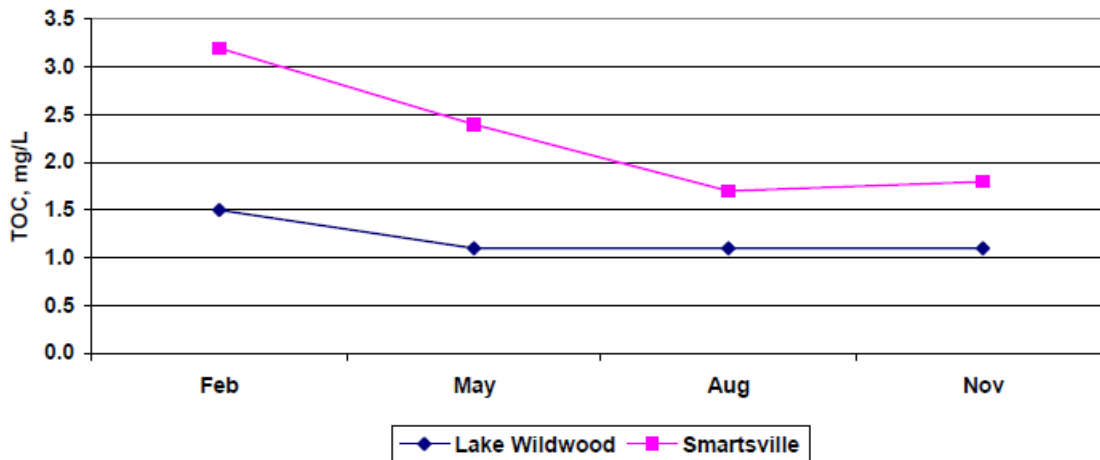
Described in the Sanitary Survey is the Friends of Deer Creek E. coli study conducted from 2005 to 2008 to determine levels of E. coli contamination along various creeks including Deer Creek<sup>3</sup>. The study showed that there are elevated E. coli levels within the Deer Creek watershed, these levels are attenuated downstream at the influent to the Smartsville WTP; the 2005-2008 median concentration of the Smartsville WTP was 48 MPN/100mL. Out of 60 months, Smartsville WTP had nine monthly medians greater than 200 MPN/100mL for E. coli, exceeding the Total Coliform Rule.

There are a number of potential sources of E.coli in the Deer Creek watershed which include runoff from ranches, cattle walking in the creeks, treated wastewater effluent, wastewater ponds, and recreation in Western Gateway Park. E. coli peaks during the month of April for the Smartsville WTP<sup>3</sup>.

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<sup>6</sup> PCWA 2005 Canal and Reservoir Feasibility Study Report Draft (pages 2 - 16)



Table 5.3: Combined Monthly Medians for E.Coli<sup>3</sup>Table 5.4: Monthly Median for Total Organic Carbon<sup>3</sup>

Livestock grazing can impact water quality by contributing sediment, total organic carbon (TOC), nutrients, and pesticides used for weed control in pastures. The risk of loading viable *Cryptosporidium parvum* oocysts into the water supply system from cattle in the watershed appears to be highest during storm events. Storms cause sheet flow over pastureland and rangeland areas that mobilize sediment and can pick up fecal matter from grazing livestock.

Livestock grazing occurs on private lands in the upper watershed and the lower watersheds. These are typically small operations with limited number of head. Three areas of particular interest are private ownership along Highway 20 between Penn Valley and Smartville.

Average TOC levels for the Smartsville WTP is 2.7 mg/L. By piping 46% of the Meade Canal, approximately 3,000 linear feet of the approximately 6,200 linear feet of Meade Canal, TOC levels can be expected to be reduced by at least 0.7 mg/L.

#### Water Supply Saved

In 2005, with grant funding from DWR (#F63108), the Placer County Water Agency (PCWA) conducted a Canal and Reservoir Feasibility Study Report<sup>6</sup> of their entire canal system to identify the soil types and permeability rates for the soils that the canals traverse. PCWA's canal system was built in the same era and in the same terrain as NID's canal and NID uses the study as a reference to estimate water losses due to seepage for defined reaches of canals. These estimates are further quantified, where feasible, with field inflow/outflow measurements.

The programmatic approach used for canal seepage estimation required that canals be segmented into reaches with similar seepage potential and grouped accordingly. For this analysis the canals were grouped by the two factors that have significant effects on the seepage coefficient and for which data are available. These are the presence of lining and soil permeability. Furthermore, Seepage tests were performed on these categories to establish an estimate of the seepage coefficients for unlined sections of canals in these soil permeability categories.<sup>6</sup>

#### **Soil Survey Permeability Ranges of Canal Categories**

<b>Canal Categories</b>	<b>Permeability (in/day)</b>
Low	.21-3
Moderately Low	7.7-9
Moderate	26-31
Moderately High	71-95
High	242-480

#### **Permeability Category Seepage Test Summary**

<b>Permeability Category</b>	<b>Number of Tests</b>	<b>Maximum Seepage Coefficient (ft3/ft2-day)</b>	<b>Minimum Seepage Coefficient (ft3/ft2-day)</b>	<b>Average Seepage Coefficient (ft3/ft2-day)</b>
Lined	2	.064	0.22	0.043
Low	1			0.014
Moderately Low	1			0.16
M-MH-H	5	1.7	0.050	0.50

These numbers were then used to calculate the total amount of water lost to seepage during an irrigation season using the following equation:

#### **Equation 1**

$$V = K * A * T$$

The seepage coefficient (K), typically expressed in units of ft3/ft2-day, which represents the average rate of loss per unit of wetted canal area for a specific reach

- The canal wetted area (A), expressed in ft<sup>2</sup>, and
- The seepage opportunity time (T), expressed in days.
- Thus, the volume of seepage (V) in ft<sup>3</sup> for any time interval is Equation 1.

Using USDA NRCS<sup>7</sup> maps to determine the local soil type of the Meade Canal, the infiltration rate for the ditch sections identified was estimated. According to the NRCS soil survey report<sup>7</sup> for the project area, one type of soil is identified (Perkins gravelly loam) and is classified as well drained with a moderately high infiltration rate of 0.20 to 0.60 in/hr. This corresponds with the PCWA study, estimating that the project will reduce water loss by approximately 25 acre-feet per year, since roughly half of the Meade canal canal (3000' of 6200') will be converted from an open unlined canal to pipe.

#### ***4. Identification of all new facilities, policies, and actions required to obtain the physical benefits.***

NID has established numerous policies and procedures, which address a wide range of topics including, but not limited to daily system operation, canal/conveyance protection, expansion procedures, annexation procedures, and conservation measures. The ones most pertinent to the raw water master planning relate to canal protection, canal improvements and conservation measures<sup>4</sup>. It is recommended that NID continue to pursue and promote conservation measures. In particular, one area that should be considered is loss management in conjunction with canal maintenance<sup>4,8</sup>. This would include installing impervious linings or converting to conduits where applicable. Therefore, no new facilities or policies will be required to obtain the physical benefits.

#### ***5. Description of any potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.***

The proposed project has the potential to result in short-term impacts to the environment immediately adjacent to the unlined ditch sections, primarily during project construction, with temporary impacts to ditch-related riparian habitat, aquatic habitat, water quality and air quality (dust). NID staff will take all steps to minimize construction impacts before, during and after construction. Longer-term effects are expected to be beneficial for surface water quality and quantity and risk of environmental damage from overflows.

#### ***6. Description of whether the proposed project effectively addresses long-term drought preparedness.***

This project addresses the following requirements from Table 1 of the 2015 Guidelines -- *ensuring a more sustainable and reliable water supply* to the DAC of Smartsville during water shortages and by *promoting water conservation* by piping an unlined 3000' section of the Meade Canal, thereby reducing water loss.

The conserved water from the proposed project will help provide a more reliable water source to the residents of the Smartsville DAC during drought years. On a region-wide basis there is tremendous opportunity for "additional" water supply through ditch and canal lining as opposed to new reservoirs or groundwater extraction. This project will help the overall regional effort to implement conservation measures while providing multiple benefits and contributing to sustainable management practices.

<sup>7</sup> NRCS Soil Survey Report 2015. Custom Soil Resource Report for Yuba County, California (pages 8, 12)

<sup>8</sup> NID 2010. Nevada Irrigation District 2010 Urban Water Management Plan (page 6-2)

## **DIRECT WATER RELATED BENEFITS TO A DAC**

As shown on the Project Map, the section of Meade canal proposed for piping is located within a designated disadvantaged community (DAC) and provides water service to a DAC area. **100% of the project service area serves the direct water-related need of a DAC.**

According to the US Census Bureau's American Community Survey's (ACS) 5-year compilation of data from 2009-2013, Smartsville is a disadvantaged community located in the Sierra Nevada Foothills. Its population is 287. Its median household income is \$41,181 per year, 68% of the Statewide MHI. The state's threshold for a DAC is to have a MHI that is 80% (i.e. \$48,875) or less of the Statewide MHI. (See map and more info in Attachment 7).

**This project provides direct critical water-supply and water needs of the Smartsville DAC** including the following from Table 9 of the 2015 Guidelines:

- Modification of a public water supply system necessary for the system to meet primary drinking water standards.
- Infrastructure renovations to a public water supply system necessary to assure continued reliability of the minimum quality and quantity of water.

Piping the 3000' section of the unlined Meade Canal will lead to improved regulatory compliance and drinking water quality (primary benefit) – see Table 5.1 and water supply saved (secondary benefit) – see Table 5.2.

The Smartsville WTP is located in Smartsville, and receives water from the Meade Canal. The Smartsville WTP is a conventional water treatment plant, consisting of coagulation, flocculation, sedimentation, pressure filtration, and post chlorination. The plant design flow is 0.085 mgd, with average flows at 0.013 mgd. Deer Creek passes through Scotts Flat Reservoir and Nevada City. Water is diverted from Deer Creek into the Newtown Canal (upstream of the Nevada City WTP) to feed the Lake Wildwood WTP. Further downstream, water is diverted from Deer Creek into the Tunnel Canal down to Squirrel Creek, then to China Union Canal. This then feeds the Meade Canal to the Smartsville WTP. This water delivery system is the main source of water for the DAC of Smartsville.



## PROJECT PERFORMANCE MONITORING PLAN

NID will monitor TOC concentrations on a quarterly schedule at the Smartsville WTP.

In accordance with the California Surface Water Treatment Rule (SWTR) and the Interim Enhanced Surface Water Treatment Rule (IESWTR) surface water agencies, such as NID, are required to conduct a sanitary survey of the source watershed once every five years. NID will continue to conduct this survey in fulfillment of the California SWTR and IESWTR.

**Table 6 – Project Performance Monitoring Plan**

<b>Project: Meade Canal DAC Project</b>		
<b>Proposed Physical Benefits</b>	<b>Targets</b>	<b>Measurement tools and methods</b>
Primary Benefit: Water Quality Improvement (i.e. reduction in Total Organic Carbon (TOC) levels)	2.0 mg/L	NID will monitor TOC concentrations on a quarterly schedule at the Smartsville WTP as has been performed in the past years using standard water quality monitoring techniques.
Secondary Benefit: Drinking Water Supply Conservation (i.e. water saved by converting to pipeline)	25 AF/Year	By piping roughly half of the Meade Canal (estimated loss of 50 AF/Year), losses can be decreased to 25AF/Year due to decreased seepage and evaporation. Water supply will be monitored at the Smartsville WTP intake.

## COST EFFECTIVE ANALYSIS

Table 7 – Cost Effective Analysis	
Project name Meade Canal DAC Project	
Question 1	<ol style="list-style-type: none"> <li>1. Primary Benefit: Water Quality Improvement (i.e. reduction in Total Organic Carbon (TOC) levels)</li> <li>2. Secondary Benefit: Drinking Water Supply Conservation (i.e. water saved by converting to pipeline)</li> </ol>
Question 2	<p>Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project being identified?</p> <p>If no, why? Alternatives methods used to improve earthen canals include: 1) gunite lining of earthen reaches where seepage is prevalent, 2) installation of vertical concrete crib-wall sections to cut off seepage or raise ditch banks (freeboard) where overflow is an issue, 3) replace failing lined ditch sections with new gunite lining. However, due to the water quality issues with the Meade Canal and the Smartsville Water Treatment Plant, these methods were not considered to be viable alternatives as they do not achieve the same type or amounts of physical benefits. None of the alternatives will prevent livestock from entering the canal, neither will they prevent contaminated run-off from pastureland from entering the canal. Therefore <b>there are no alternatives that achieve the same type or amounts of physical benefits.</b></p>
	<p>If yes, list the methods (including the proposed project) and estimated costs.</p>
Question 3	<p>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.</p> <p>The proposed project <b>is the least cost alternative</b> providing the types and amounts of physical benefits proposed.</p>
Comments:	

## PROJECT 3: DROUGHT RESPONSE DISINFECTION BY-PRODUCT REDUCTION PROJECT: PCWA

### PROJECT DESCRIPTION

Install tank mixers and ventilation systems at seven water storage tanks to reduce disinfection byproduct levels and reduce system water loss in domestic water supply.

#### Additional Project Description Project Information:

The Placer County Water Agency (PCWA) and its customers have successfully increased water conservation as a response to the ongoing statewide drought. However, this effective response has led to a paradoxical situation:

- The reduction in water use has increased temperatures and the disinfectant residence time within PCWA's water storage tank systems causing the levels of disinfection byproduct, specifically total trihalomethanes (TTHM), formation to approach, and in some cases exceed, the primary Maximum Contaminant Level (MCL) of 0.080 mg/L.
- In order to maintain water quality, PCWA has no alternative but to drain and refill the tanks on a monthly basis leading to a loss of 696 acre feet of water per year.

To reduce the TTHM levels in the water supply storage tanks and to conserve water, the project will include the installation of a tank mixer and ventilation system at seven tanks in PCWA's service area – specifically in the Auburn/Bowman and Colfax distribution systems. Installing a tank mixer and ventilation system provides a mixed condition in which the mixture of older and newer aged water has a higher blended disinfectant residual, which improves control of microbial re-growth, and minimizes disinfection byproduct formation by eliminating stratification. Tank mixers can also improve water quality freshness throughout a water tank. The tank mixer provides better conditions for more volatilization of TTHMs, while the ventilation system improves release of the volatilized TTHMs from the tank. The primary benefits of this project include:

1. Improved regulatory compliance and drinking water quality.
2. Conserved water supply (by reducing the amount of water loss related to draining and filling of tanks which is needed to control TTHM levels in the absence of tank mixer and ventilation systems).

The project entails installing tank mixers and ventilation systems in the seven tanks listed below, at locations throughout its service area where TTHMs are reaching unacceptable concentrations and are in service areas identified as Disadvantage Communities (DAC). Three of the tanks have already had a mixer and ventilation system installed as noted below:

1. Colfax Clearwell Tank (1 MG), completed December 2014.
2. Ball Park Tank (0.6 MG), completed December 2014.
3. Colfax Clearwell Tank (0.3 MG), completed December 2014.
4. Bowman Clearwell Tank (10 MG).
5. Bell Road Tank (1 MG).
6. Channel Hill Tank (1 MG).
7. Electric Street Tank (5 MG).

The work anticipated for the project includes the following:

1. Purchasing the tank mixers and ventilation systems.
2. Planning for the installation of the tank mixers at each of the tanks listed above considering water supply needs and timing of taking a tank off-line.
3. Installing the tank mixers and ventilation systems.
4. Demobilization Performance Testing of TTHM levels.



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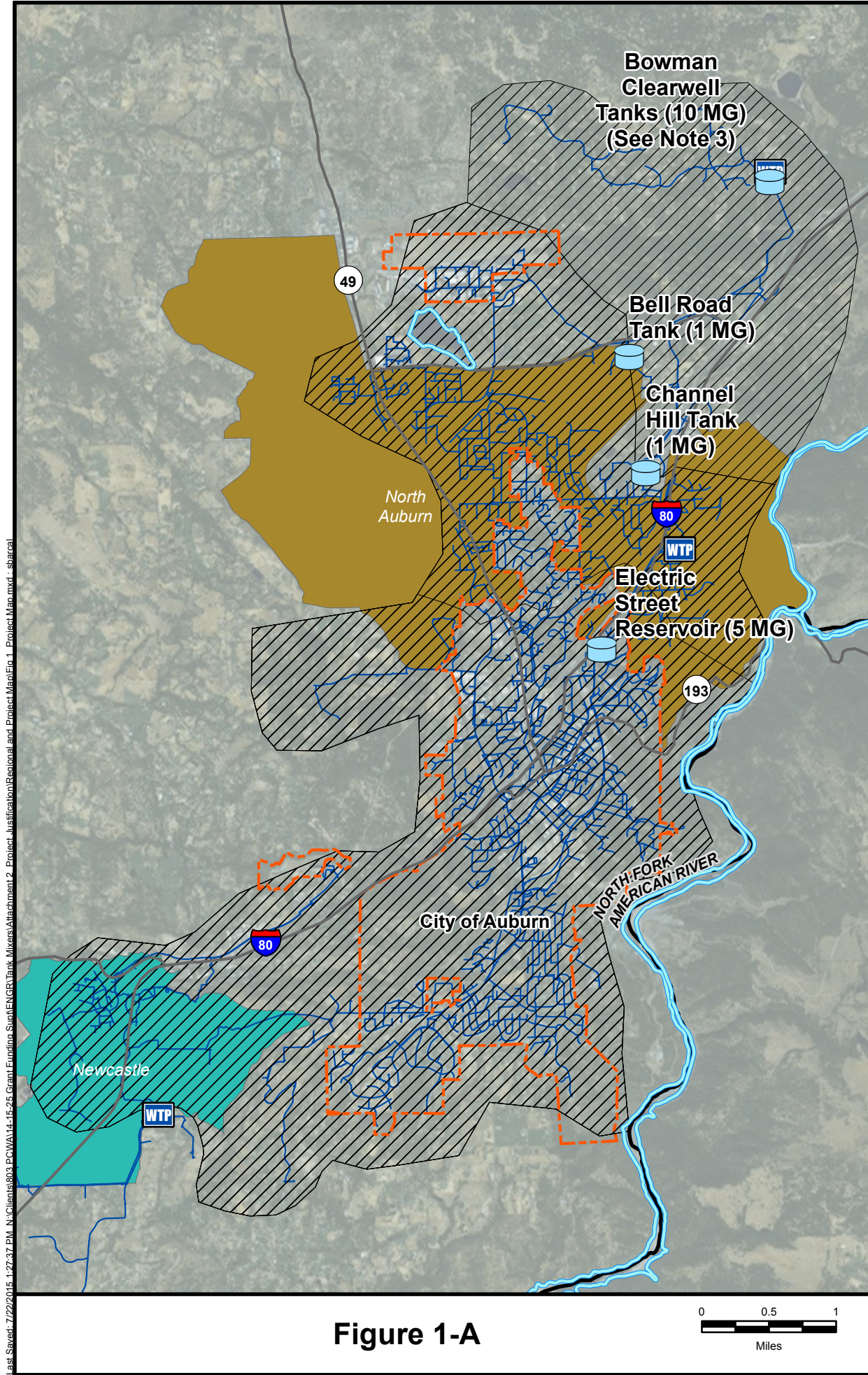


Figure 1-A

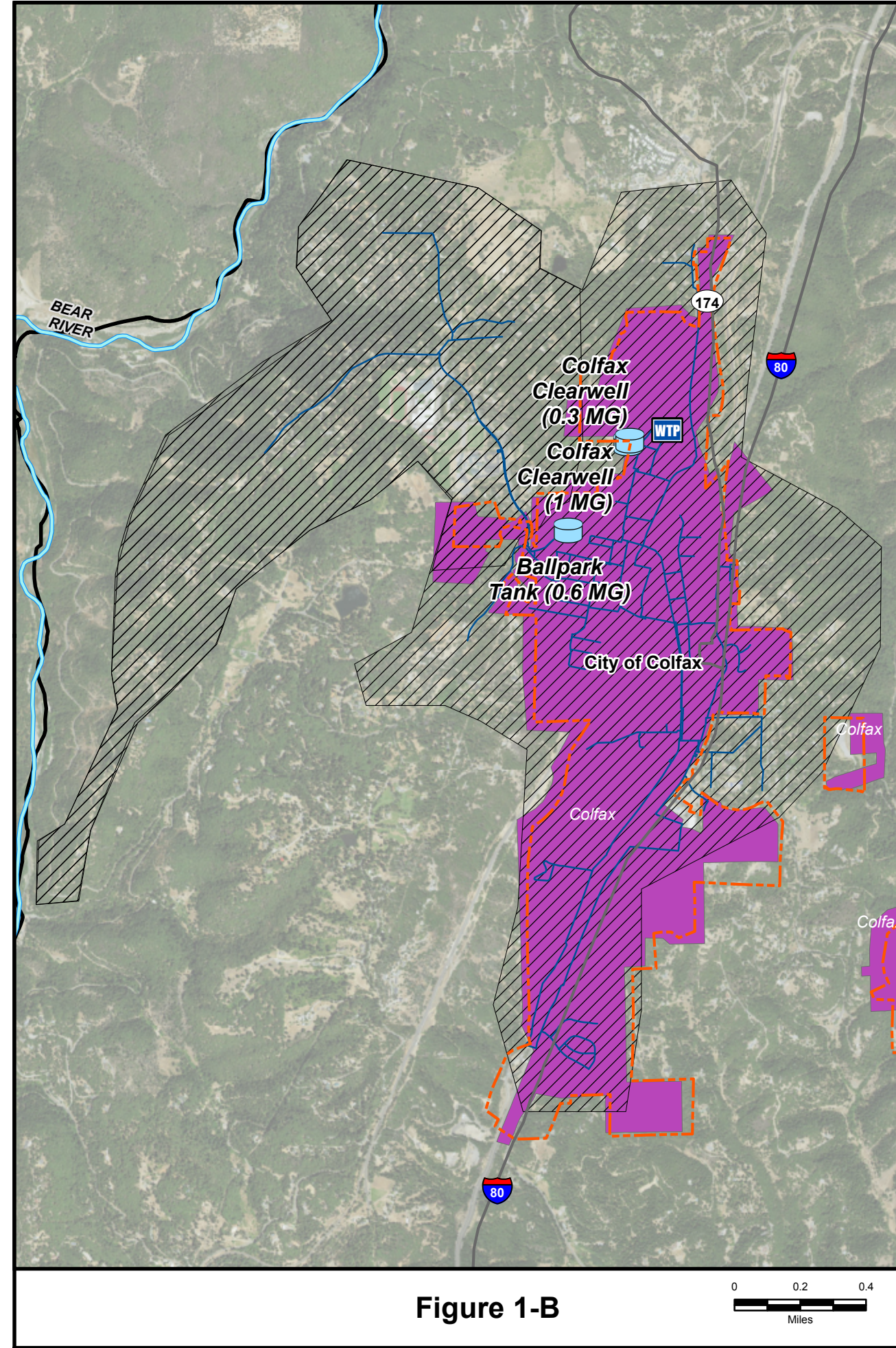
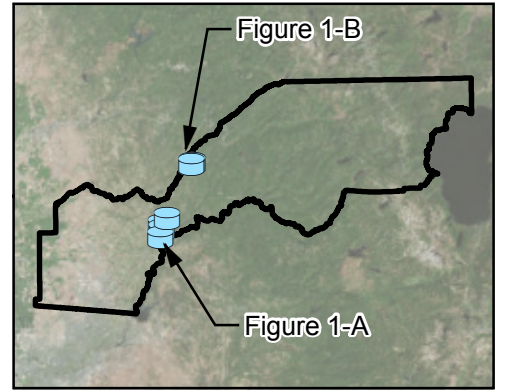


Figure 1-B



**Symbology**

- Project Tank/Clearwell
- Water Treatment Plant
- Existing Water Distribution Pipeline
- River

**Census Designated Places (See Note 1)**

- Colfax
- Newcastle
- North Auburn

**Other Symbols**

- Tank/Clearwell Area of Influence (See Note 2)
- City Limits
- PCWA Boundary

**Notes:**

- DAC designated areas are based on the DWR developed dataset boundaries for Census Places using data from 2009 to 2013 and the Proposition 84 IRWM Guidelines (2015) definition. The boundaries are intended for informational purposes only and are not definitive and do establish legal rights or define legal boundaries.
- The tank and clearwell area of influence shapefile was created by PCWA staff received July 14, 2015.
- The Bowman Clearwell, although not located physically in a DAC designated area, supplies domestic water to DAC designated areas as displayed in the Area of Influence.

**Project 3:**  
**Drought Response Disinfection Byproduct Reduction Project Sites**  
Placer County Water Agency  
Attachment 2: CABY 2015 IRWM Implementation Grant



## PROJECT PHYSICAL BENEFITS

The project has the following physically quantifiable benefits:

1. Improved regulatory compliance and drinking water quality (primary benefit) – see Table 5.1
2. Conserved drinking water supply (secondary benefit) – see Table 5.2

The improved drinking water quality specifically refers to the reduced level of TTHMs as a result of water mixing and tank headspace ventilation. The conserved water results from the avoidance of draining and filling the tanks that would otherwise be required to achieve the same water quality benefits that the proposed project will provide.

**Table 5.1 – Annual Project Physical Benefits**

Project Name: Drought Response Disinfection By-Product Reduction Project

Type of Benefit Claimed: Primary Benefit: Water Quality Improvement (i.e. reduction in total trihalomethane (TTHM) levels)

Units of the Benefit Claimed : mg/L

Anticipated Useful Life of Project (years) 20

(a)	(b)	(c)	(d)
Physical Benefits			
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0.070	0.037	0.033
2016	0.070	0.037	0.033
2017	0.070	0.037	0.033
Etc. through last year of Project Life	0.070	0.037	0.033

**Comments:** The TTHM concentration shown in Column b is an average of the TTHM concentrations observed in the three Colfax tanks, between May and October 2014, and the four Auburn tanks between April 2014 and June 2015. The "With Project" column (c) shows the average TTHM in the two Colfax Clearwells and Ball Park tank post installation of the project from December 2014 to March 2015. Refs: National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule, Final Rule, FR Vol. 71, No. 2, p 388, January 4, 2006.

U.S. EPA. Initial Distribution System Evaluation Guidance Manual for the Final Stage 2 Disinfectant and Disinfection Byproducts Rule. Appendix A. January 2006.

[http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/upload/2006\\_02\\_08\\_disinfection\\_stage2\\_guide\\_idse\\_app\\_a.pdf](http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/upload/2006_02_08_disinfection_stage2_guide_idse_app_a.pdf)

U.S. EPA. Basic Information about Disinfection Byproducts in Drinking Water: Total Trihalomethanes, Haloacetic Acids, Bromate, and Chlorite. July 2015.

<http://water.epa.gov/drink/contaminants/basicinformation/disinfectionbyproducts.cfm>

Table 5.2 – Annual Project Physical Benefits

Project Name: \_\_Drought Response Disinfection By-Product Reduction Project\_\_

Type of Benefit Claimed: \_Secondary Benefit: Drinking Water Supply Conservation (i.e. water saved by not flushing distribution lines)

Units of the Benefit Claimed : \_\_acre-feet per year (AFY)\_\_\_\_

Anticipated Useful Life of Project (years) \_20\_\_\_\_

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	696	696
2016	0	696	696
2017	0	696	696
Etc. through last year of project life	0	696	696

**Comments:** It is estimated that it requires 226.8 million gallons (696.0 AFY) to drain and fill each of the seven tanks every month to achieve the same water quality improvement that will be obtained through the use of tank mixer and ventilation systems. By implementing this project the water shown in column (d) is conserved.

## TECHNICAL ANALYSIS OF PHYSICAL BENEFITS CLAIMED

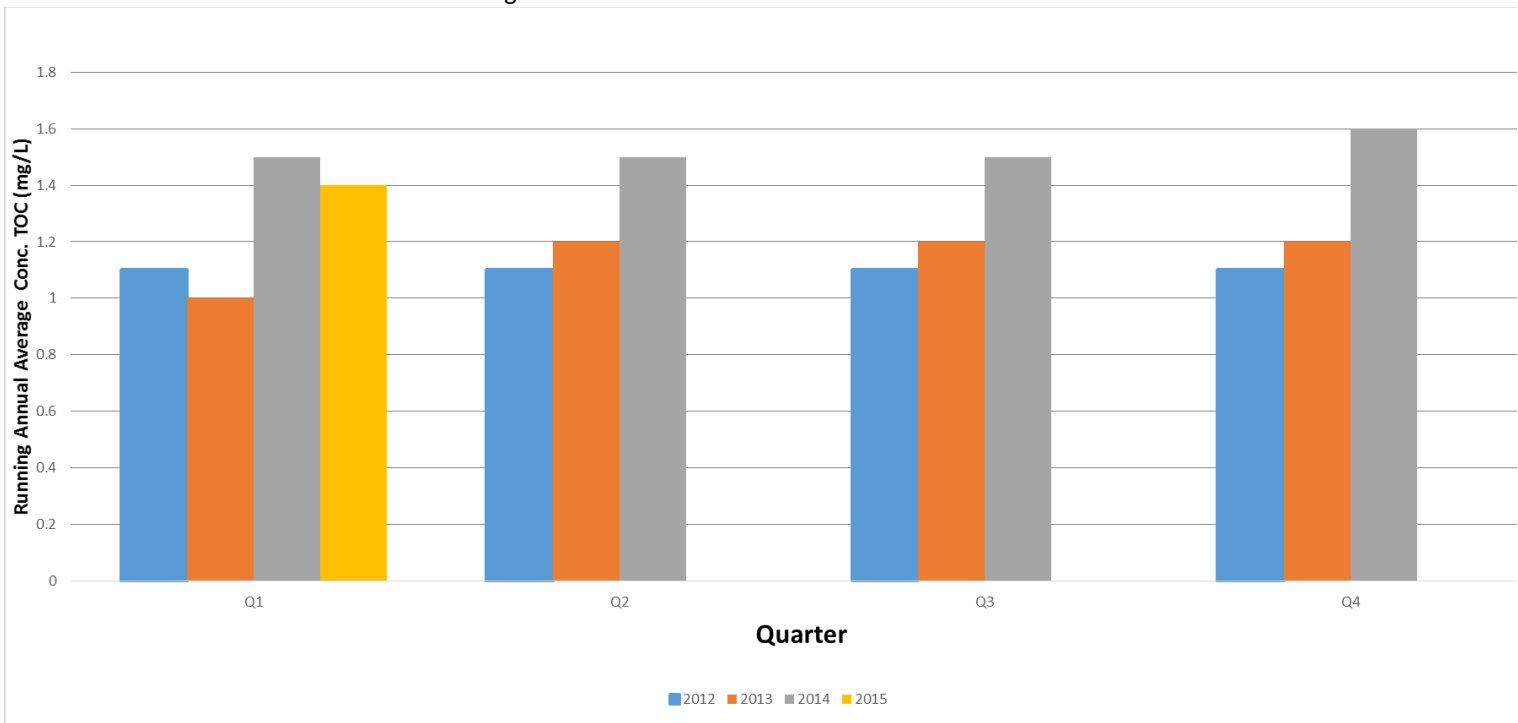
### 1. Need for the Project

Since 2013, the levels of TTHMs in the Auburn/Bowman and Colfax drinking water distribution systems have steadily been approaching, and sometimes exceeding, the MCL of 0.080 mg/L. TTHMs, a by-product of disinfection with chlorine, are formed when chlorine oxidizes portions of the organics in the water. Due to the drought, raw water supplies have both an increased temperature and increased amount of organics, and customers are using less water in response to the drought. All of these direct results from the drought mean that there is an increased probability that disinfection by-product concentrations will increase because:

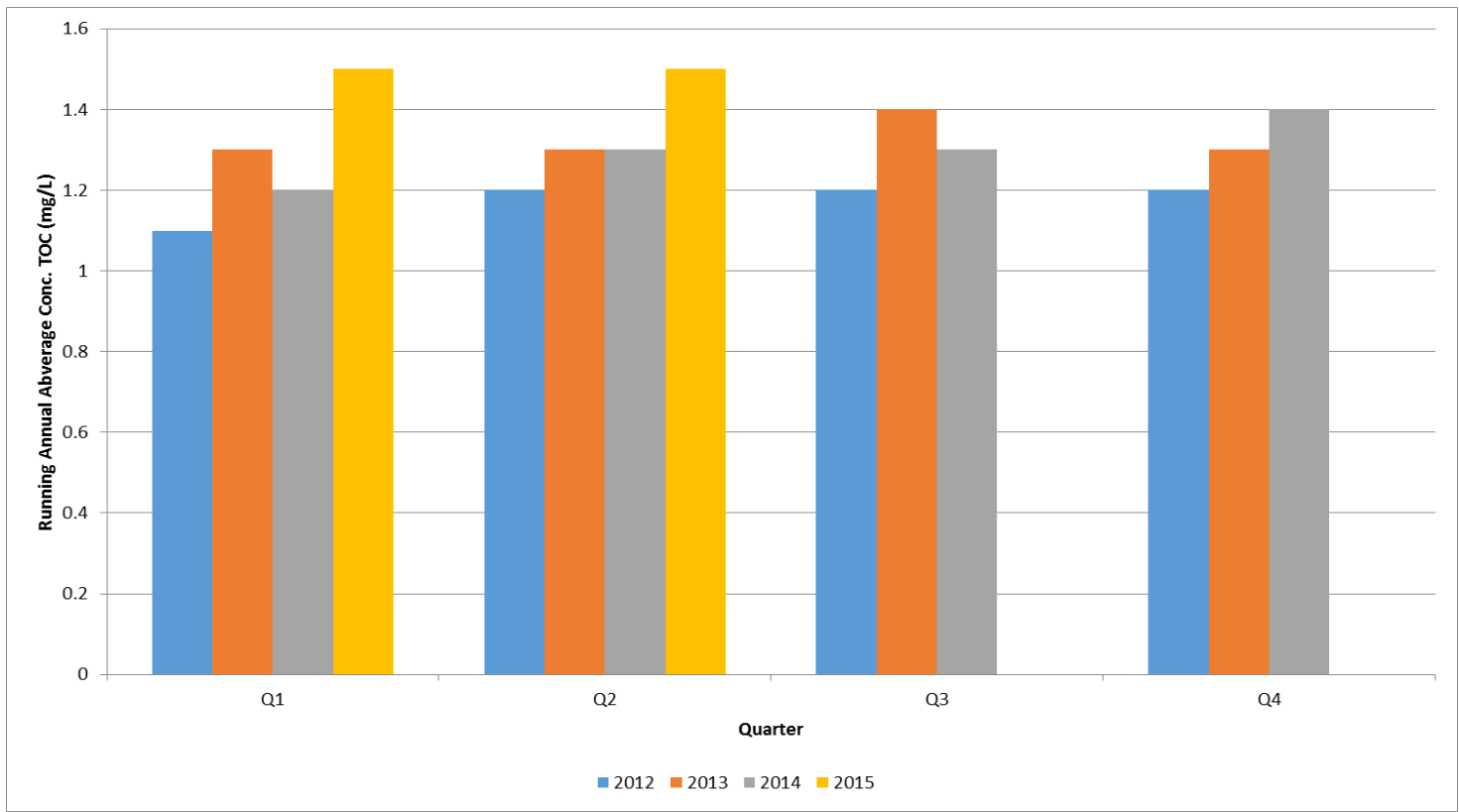
- a) there is a higher concentration of natural organic matter in the source water and also in the distribution system with which the chlorine can react,
- b) there is an increased residence time for the organics and chlorine reactions to occur in the system, and
- c) the higher water temperatures will increase the disinfection by-product formation rate.

#### a) Organic Compounds in Raw Water

Total organic carbon (TOC) is used as a method of quantifying the natural organic matter in water. The raw water sources for the Auburn/Bowman and Colfax water distribution systems have generally seen an increase in the TOC concentration during the past three years, as seen from the WTP influent data collected by PCWA staff and shown on Figure 2 and Figure 3, and is anticipated to continue to increase as the drought continues. Natural organic matter, especially the dissolved organic carbon (DOC) fraction, is not completely removed by the water treatment processes at PCWA's treatment plants. Higher concentrations of organic compounds in the raw water can result in higher concentrations in the treated water in the distribution system. As customers conserve water in response to the drought, the organic carbon compounds and chlorine have more time in which formation of TTHMs can occur. The increased level of organics in the raw water sources contributes to the increase in TTHM formation.



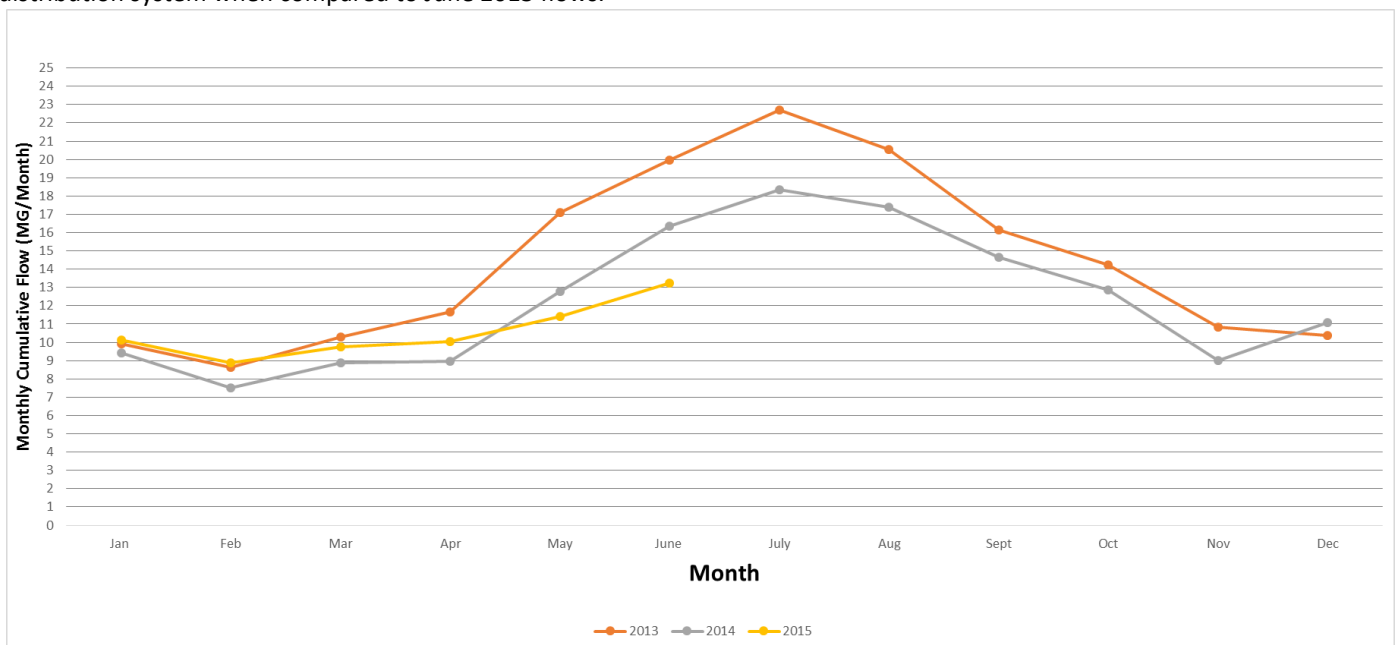
**Figure 2: Colfax Raw Water TOC**



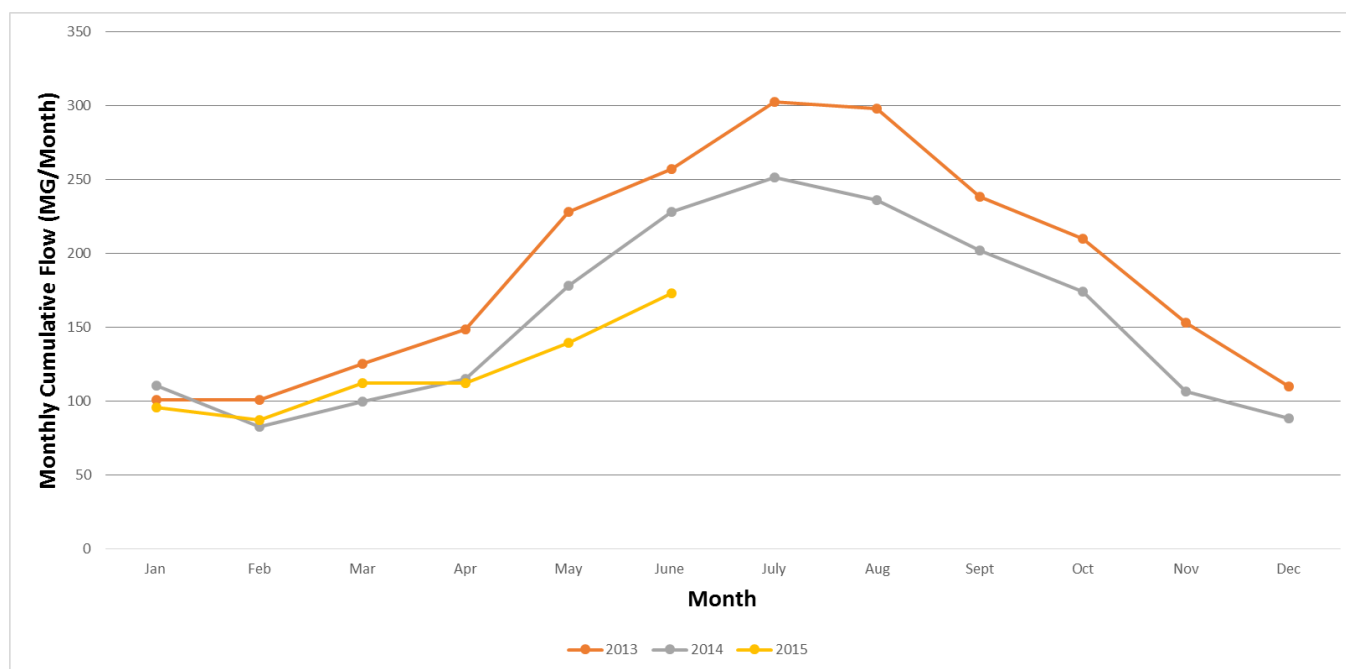
**Figure 3: Bowman Raw Water TOC**

#### b) Increased Water Age

As water use has decreased substantially since 2013 across PCWA's system due to water conservation efforts, PCWA has noticed consistently lower average daily flows and corresponding elevated levels of TTHMs in its water distribution systems. As the flow through the distribution system decreases, the residence time and water age increases, thereby providing more time for TTHM formation. As shown on Figs 4 and 5, flows have dropped significantly between 2013 and 2014 and have continued to drop during the first half of 2015 for both the Colfax and Auburn/Bowman water distribution systems. During June 2015 water use has decreased by nearly 7 MG (35%) for the Colfax distribution system and by approx. 84 MG (33%) for the Auburn/Bowman distribution system when compared to June 2013 flows.



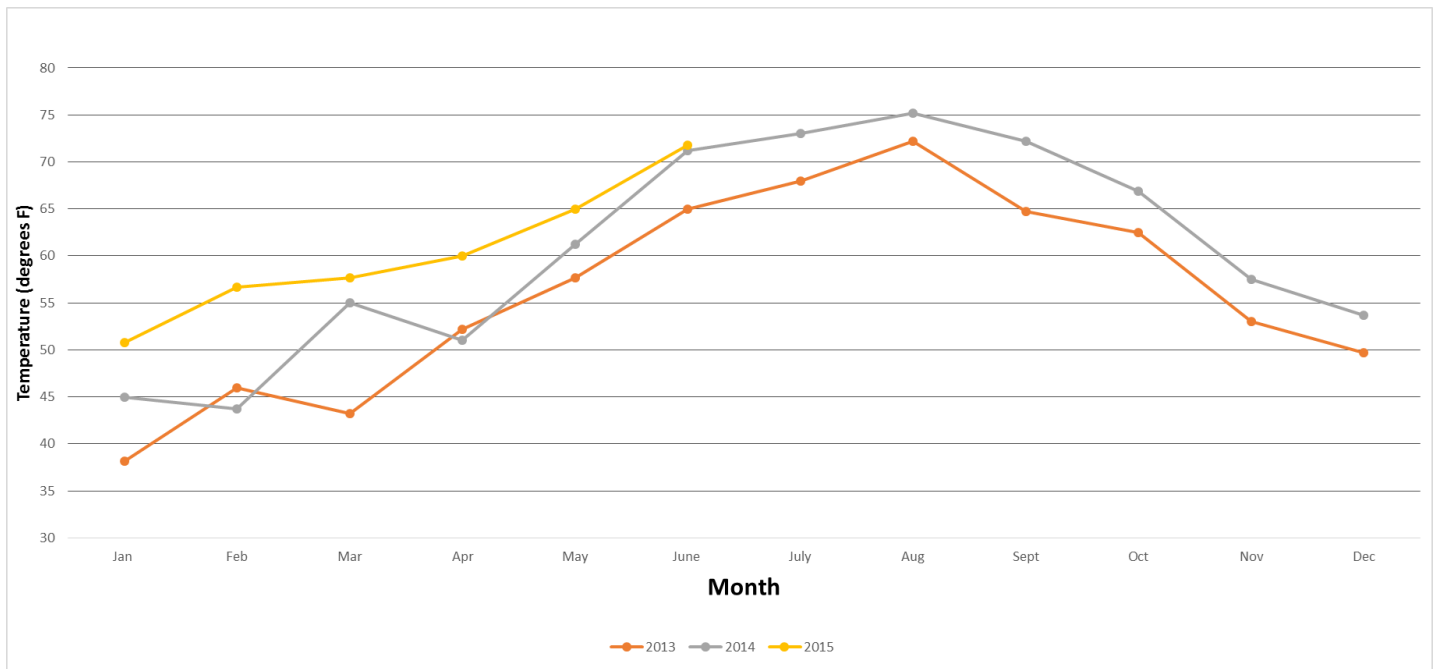


**Figure 4: Colfax Flows****Figure 5: Auburn/Bowman Flows**

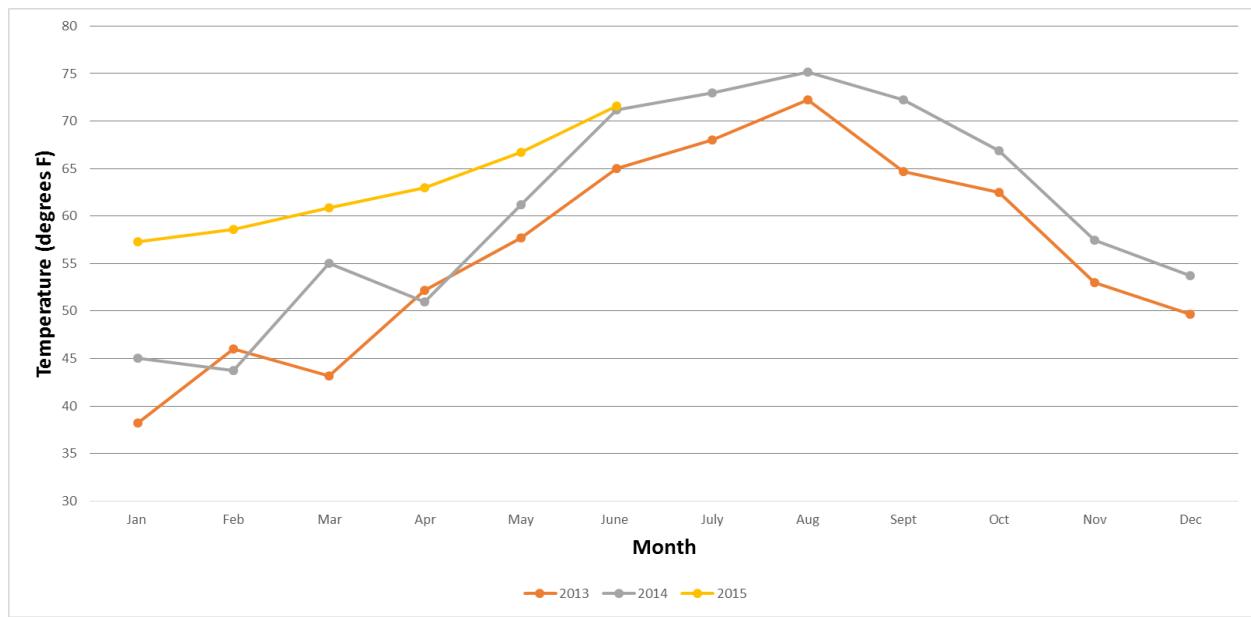
As water sits in the tanks, thermal stratification occurs and water ages. The reduction in water use contributes to less tank ‘turnover’ creating a persistent thermal stratification. Stratification results in a layer of warmer water “floating” on top of the some-what colder water that fills and is withdrawn from each tank during its daily operating cycle. The layer of warmer water can remain within a tank for an extended period thereby providing more time for undesirable TTHM formation reactions to occur.

#### c) Increased Temperatures

As PCWA’s reservoir and river supply levels have dropped, water temperatures have increased. Increased temperatures facilitate increased formation of TTHMs (EPA, 2006). As shown on Figure 6 and Figure 7, there has been an increase in water temperatures for both the Colfax and Auburn/Bowman distribution system since 2013. The temperature readings shown in the figures were taken by PCWA staff at the influent of the respective treatment plants.



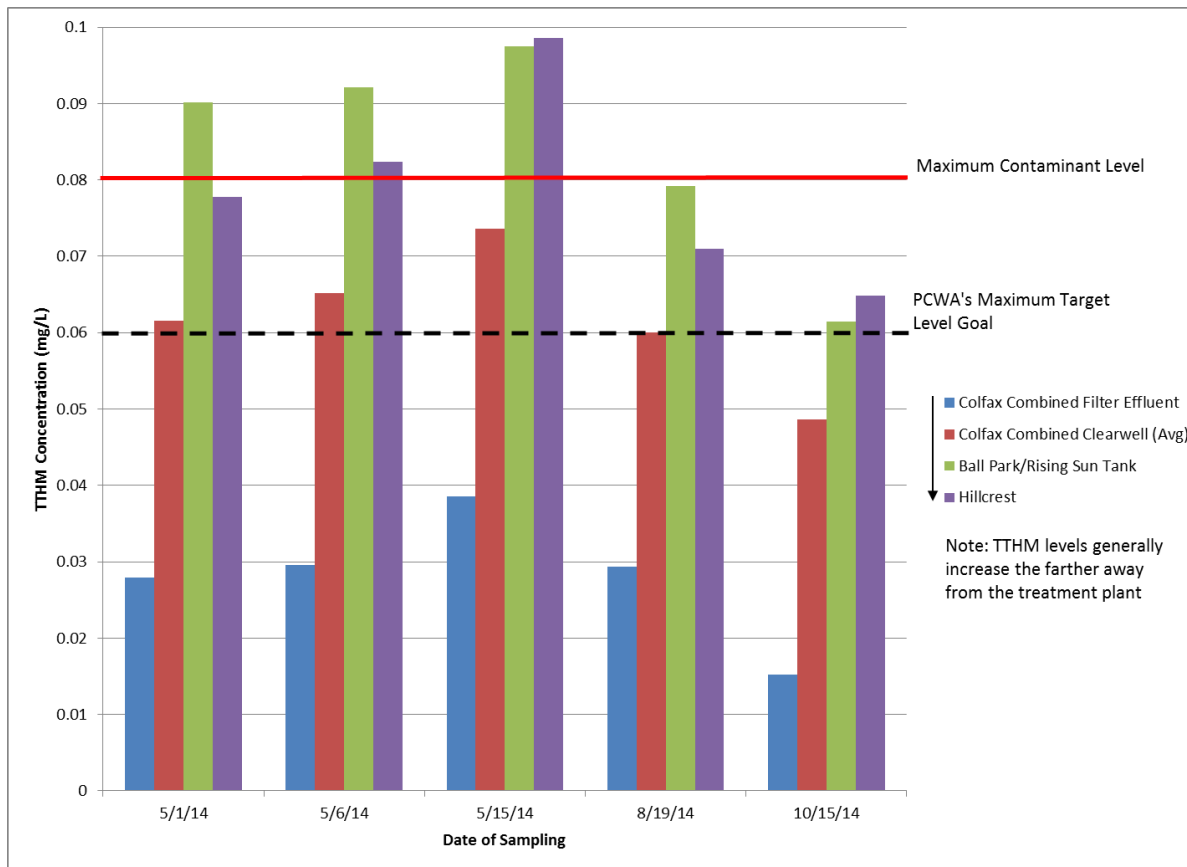
**Figure 6: Colfax Temperatures**



**Figure 7: Auburn/Bowman Temperatures**

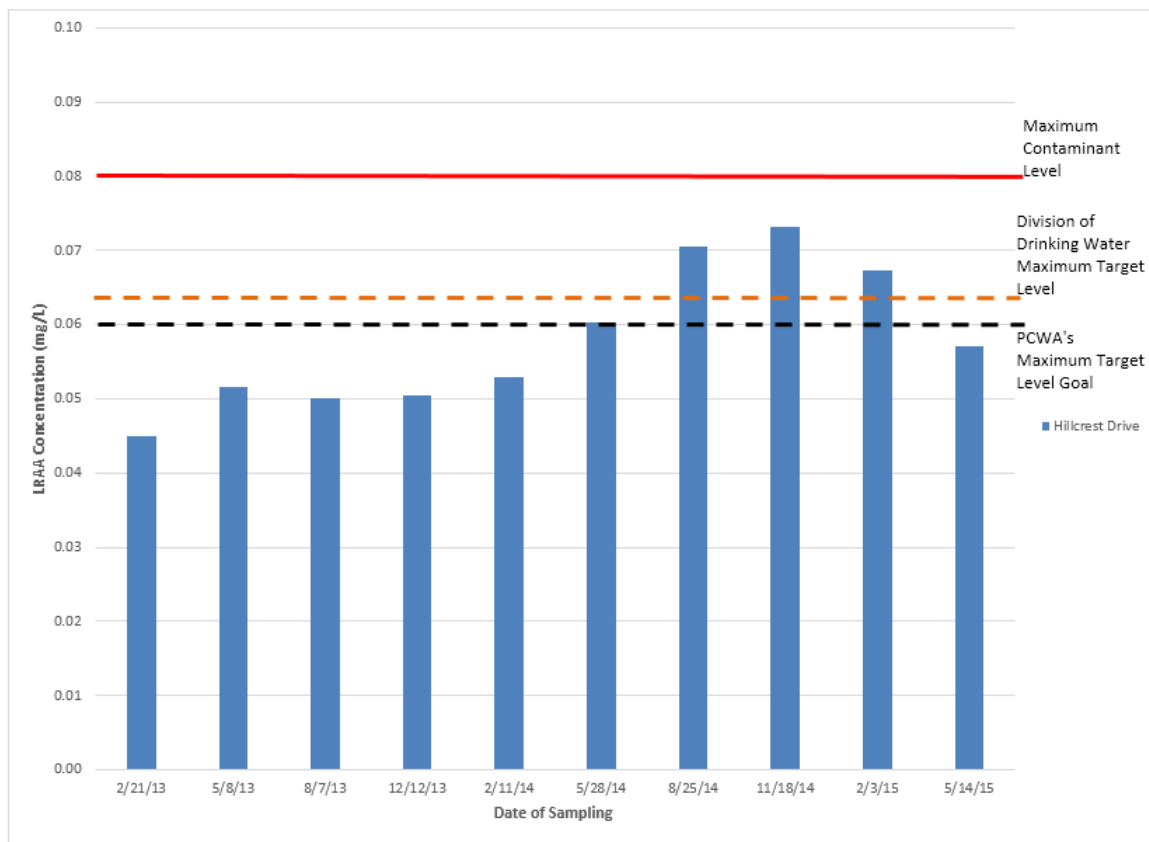
#### Conclusion of Project Need

Drought conditions such as reduced system flow, along with increased temperatures and amount of organics, have exacerbated the formation of TTHMs in the Auburn/Bowman and Colfax PCWA distribution systems. A summary of TTHM samples taken in the Colfax system between May 2014 and October 2014 is shown on Figure 8. As shown on Figure 8, TTHM levels throughout the Colfax system were approaching and even exceeding the 0.080 mg/L MCL for TTHMs during this time period. TTHM levels at various sampling locations throughout the Colfax system is summarized on Figure 8. Note that in Figure 8 generally the farther the sampling point was from the plant clearwell the higher the TTHM levels.



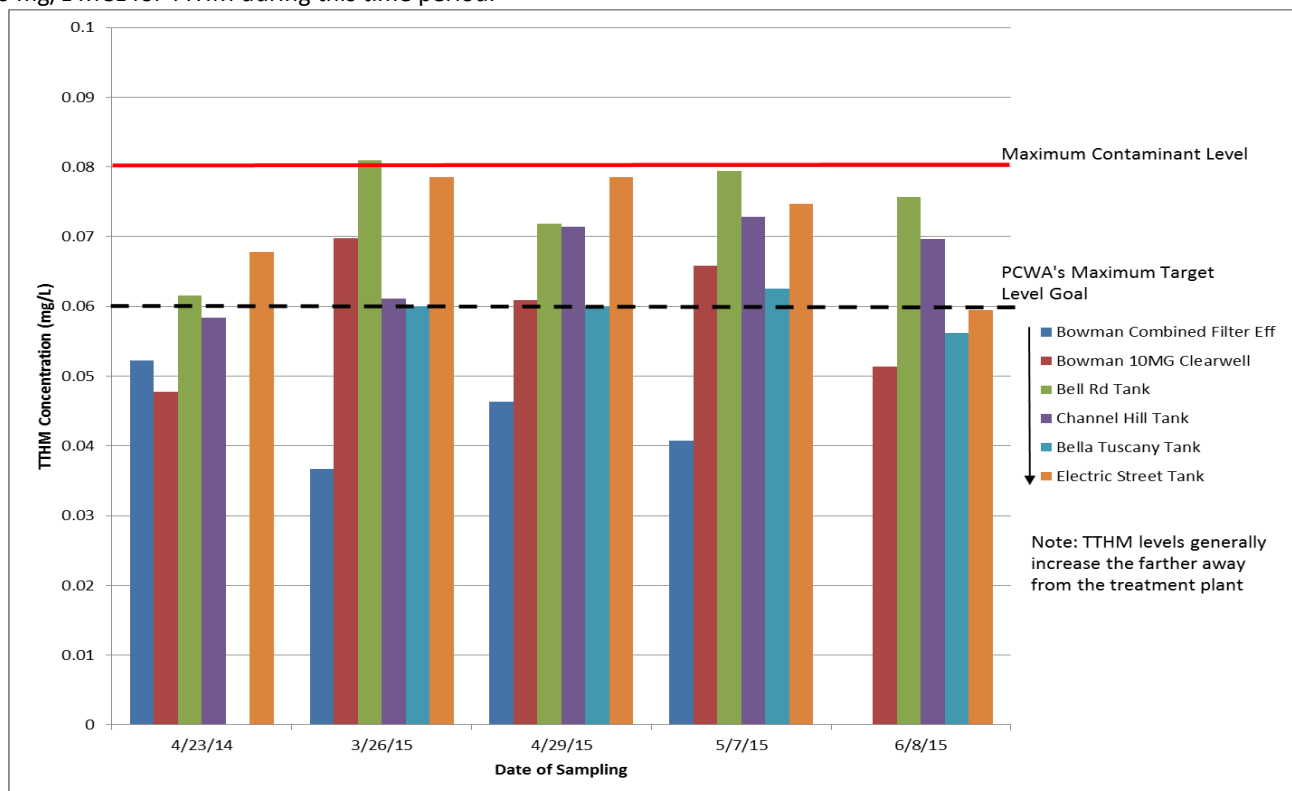
**Figure 8: TTHM Concentrations in the Colfax System**

Furthermore, at the Hillcrest Drive location in the Colfax distribution system where PCWA performs quarterly monitoring of disinfection by-products (both TTHMs and Haloacetic acids – HAA5s) per Division of Drinking Water Stage 2 Disinfection Byproduct compliance requirements, the locational running annual average (LRAA) steadily increased from the first quarter of 2013 until the tank mixers were installed in the fourth quarter of 2014. The LRAA in the third and fourth quarter of 2014, prior to the installation of the tank mixers, exceeded the state's maximum target level threshold of 0.064 mg/L (80% of the MCL) as shown on Figure 9. HAA5s did not exceed any thresholds in the Colfax distribution system.



**Figure 9: Colfax System Stage 2 Disinfection Byproducts Compliance Distribution System Monitoring For TTHMs**

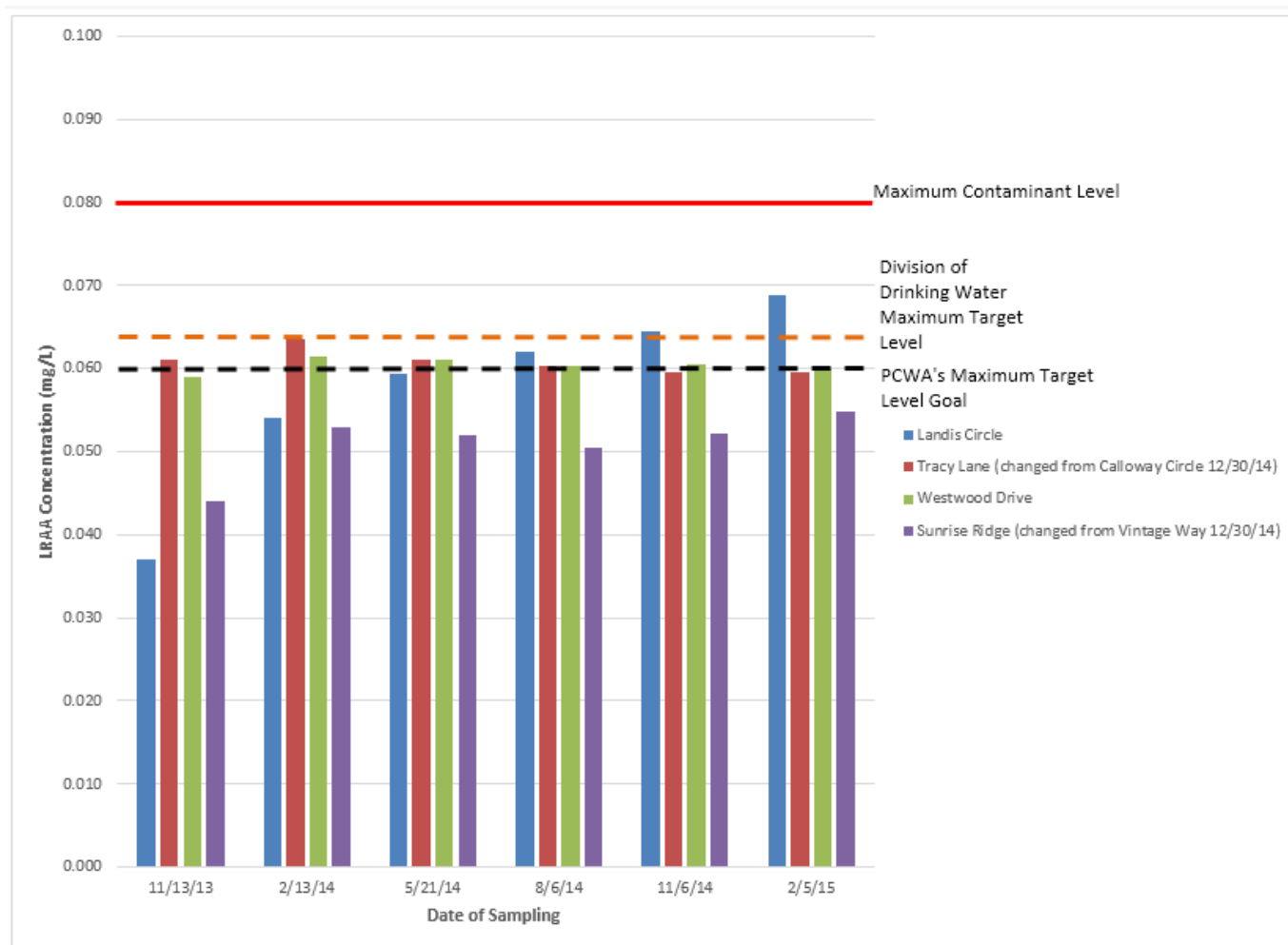
Figure 10 provides a summary of TTHM samples taken by PCWA staff in the Auburn/Bowman system between April 2014 and June 2015. As shown on Figure 10, TTHM levels in the Auburn/Bowman system were approaching and even slightly exceeding the 0.080 mg/L MCL for TTHM during this time period.



**Figure 10: TTHM Concentrations in the Auburn/Bowman System**



At the four locations in the Auburn/Bowman distribution system where PCWA performs quarterly monitoring of disinfection by-products (both TTHMs and Haloacetic acids – HAA5s) per Division of Drinking Water Stage 2 Disinfection Byproduct compliance requirements, the LRAA exceeded and hovered near the state’s maximum target level threshold of 0.064 mg/L (80% of the MCL) between the fourth quarter of 2013 and the first quarter of 2015 as shown in Figure 11. HAA5s did not exceed any thresholds in the Auburn/Bowman distribution system.



**Figure 11 Stage 2 Disinfection Byproducts Compliance Distribution System Monitoring For TTHMs**

In response to these conditions, the water treatment plant operators have done all that they can at the water treatment plants to remove disinfection byproduct precursors to control the TTHM concentration in the distribution system. The chlorine disinfection concentrations have already been adjusted as part of a strategy to reduce TTHM formation while also meeting regulatory requirements that a measurable disinfectant concentration be present throughout the water distribution system. To maintain an acceptable chlorine residual without exceeding TTHM limits, a solution within the distribution system, such as what this proposed project offers, is needed.

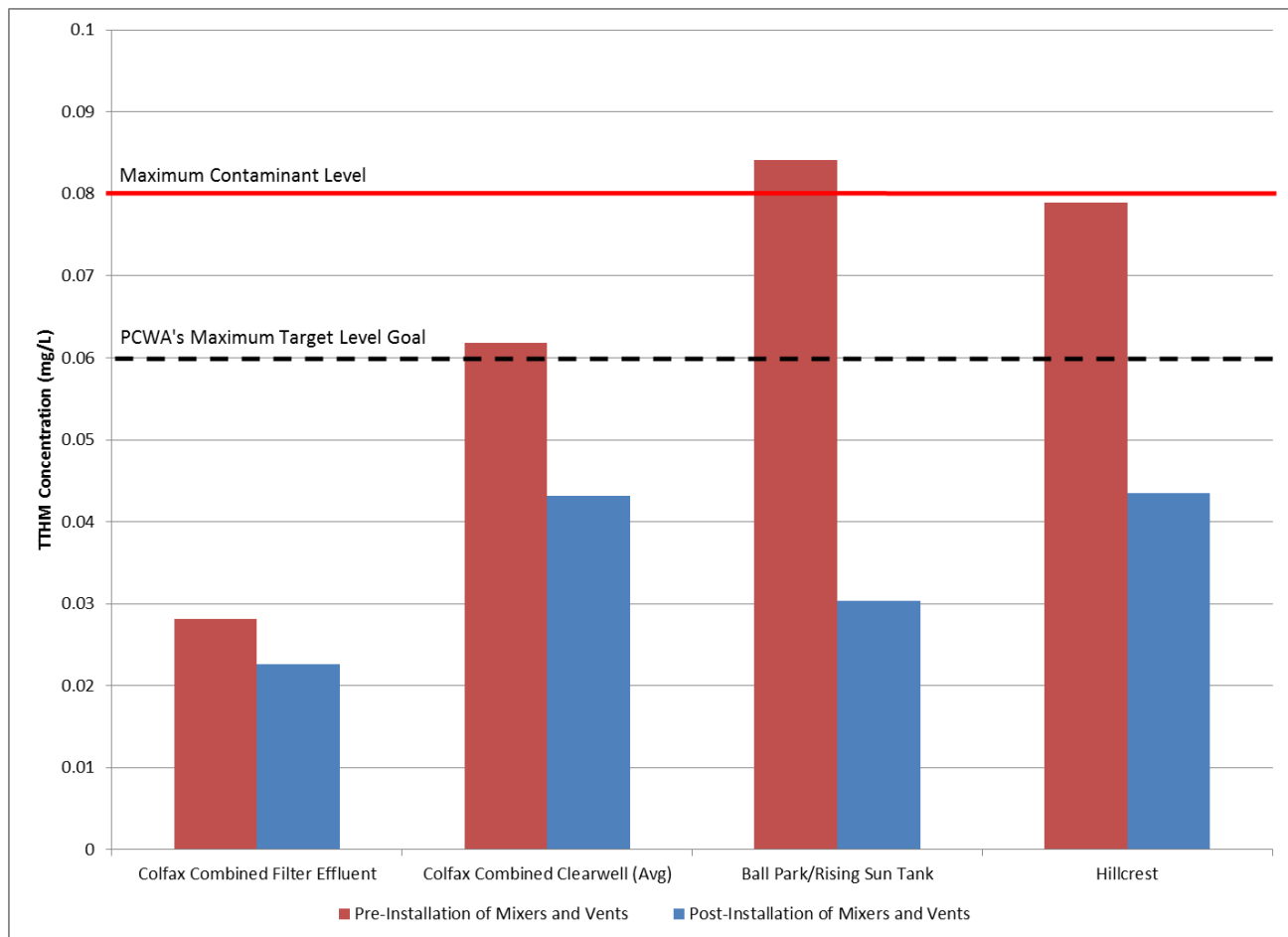
## **2. Estimates of “without-project” conditions**

Without the proposed project, TTHM levels are expected to remain elevated and above the target maximum level of 0.06 mg/L and likely approaching and even exceeding the MCL of 0.080 mg/L. As a temporary measure, tank draining and filling would be conducted to control TTHM levels. However, the amount of draining and filling the tanks would likely be restricted due to drought conservation mandates. Furthermore, draining and filling the tanks would only offer a short-term solution to this water quality problem that would persist for the duration of the current and future droughts.

### 3. Description of methods used to estimate physical benefits

#### *Drinking Water Quality Benefit (Primary Benefit):*

TTHMs are a regulated public health concern based on evidence that people drinking water containing TTHMs in excess of the MCL over many years, could experience liver, kidney, or central nervous system problems and increased risk of cancer (US EPA). In response to undesirable concentrations of TTHMs in early 2014, PCWA installed mixers and ventilation systems on two tanks (Colfax 1 MG and Colfax 0.3 MG) and one tank (Ball Park/Rising Sun 0.6 MG) within the Colfax system in the fall of 2014. Since 2014, TTHM levels in the Colfax system have dropped significantly as shown in Figure 12 providing quantifiable support for the successful removal of TTHMs through the project tank and ventilation system installation.



**Figure 12: Average TTHM Concentrations in the Colfax System Pre- and Post- Project**

#### *Conserved Drinking Water Supply Benefit (Secondary Benefit):*

Without this project, PCWA would need to drain and fill the tanks in order to control TTHM levels. Draining and filling storage tanks can reduce water age, which can have higher TTHM concentrations due to long residence times. This practice of draining and filling tanks, however, wastes large volumes of water as none of the water is recaptured. This waste of water doesn't match PCWA's most recent conservation mandate, per Resolution 15-10, to reduce water use at least 25% compared to 2013 levels. In response to the Governor's April 1, 2015 Executive Order, which mandated a 25 percent reduction in water use in comparison to 2013, on April 16 the PCWA Board adopted Resolution 15-10 declaring a water shortage emergency.

PCWA surmises that the most practical way to eliminate the stratification and stagnation in the tanks other than through mechanical mixing would be to completely drain and refill the tanks. Partial volumes of the tanks could be drained but this method would require extensive testing and sampling to determine the amount of partial draining required for each tank. Personnel and testing costs would quickly exceed the value of water 'saved' and would not guarantee that the TTHM level would be sufficiently lowered. PCWA estimates that they would have the staffing capacity to drain and refill the full volume of the seven tanks once a month. The draining and refilling of the tanks would be limited to a monthly basis both by PCWA staff availability

and an effort to limit the amount of water ‘wasted’. Draining and refilling the seven tanks every month would result in 18.9 million gallons of treated water being wasted each month – or 226.8 million gallons a year (696 acre-feet per year). It is unknown if draining and refilling the tanks on a monthly basis would be adequate to meet the water quality regulations for TTHMs or if an even more frequent draining and refilling schedule would be needed. If drought conditions subside in the future, less volume may be needed to adequately flush the system. Therefore, the estimated quantity of water saved in Table 5.2 may be slightly overestimated. However, it is uncertain if ongoing drought conditions are the new normal or if drought conditions will decrease in the coming years. Table 5.2 was prepared with today’s present water use conditions projected through the life of the project. Regardless of the presence or absence of a drought, the tank mixing and ventilation system offers a long-term solution and provides PCWA with more flexibility in handling varying water quality conditions and possible future droughts. After paying the upfront capital investment cost of the tank mixers and ventilation systems, only a nominal cost for energy to operate is required to utilize the tank mixing system.

**4. New Facilities Required to Obtain the Physical Benefits:** The chlorine disinfectant concentration rates have already been adjusted to balance the need to meet minimum residual level requirements throughout the water distribution system with the need to minimize TTHM formation. Therefore, the next step is to implement a mechanical solution in the distribution system. A tank mixer and ventilation system is proposed to be installed and operated on a continual basis at each of the seven project tanks identified in the Auburn/Bowman and Colfax systems to obtain the physical benefits shown in Table 5.1 and 5.2. The specific equipment proposed is the PAX Submersible Active Mixing system and PAX Power Vent. The impeller style tank mixer facilitates a uniform distribution of treated water and water age in the tank, which can increase the disinfectant residual concentration, which improves control of microbial re-growth and TTHM formation. Mixing also allows a substantial increase in the portion of the treated water that comes in contact with the air in the headspace of the tank, thereby enhancing volatilization of TTHMs. A power vent enhances removal of air from the tank’s headspace. This air contains the volatilized TTHMs and replaces it with fresh air, which enhances the process of volatilizing TTHMs from the water as it is mixed.

**5. Potential Adverse Physical Effects** If the timing of the mixing system installation is not done strategically, the ability to deliver water to customers may be impacted. Other consequences could include loss of pressure or reduced flows. To mitigate these potential effects, the tank mixers and ventilation systems will be installed during months of low demand so that tanks can be taken out of service and not affect overall distribution system performance and water deliveries to customers.

#### **6. Description of Whether the Proposed Project Effectively Addresses Long-term Drought**

**Preparedness:** This project addresses the following requirements from Table 1 of the 2015 Guidelines -- *ensuring a more sustainable and reliable water supply* to DACs in the CABY region by *promoting water conservation*. The proposed project offers a long-term solution to drought-induced water quality challenges while promoting water conservation and achieving long-term reduction in water use. The tank mixer and ventilations systems are a water conscious approach to addressing unacceptable TTHM concentrations – which are a direct result of on-going drought conditions. Without this project, PCWA would waste large volumes of water draining and filling tanks to control TTHM levels. The project offers a long-term solution and provides PCWA with more flexibility in handling variable water quality conditions and enduring future droughts. By implementing this project, PCWA will be able to promote continued water conservation measures by providing high quality water even during the operational challenges associated with drought conditions as well as setting a good example of the importance of water conservation for PCWA's water users. With the installation of tank mixers, a more consistent water quality can be maintained throughout PCWA’s distribution systems and TTHM levels will be minimized. For the life of this project, the Auburn/Bowman and Colfax distribution systems will be able to deliver high quality water in spite of TTHM formation-inducing conditions brought on by drought. This project also effectively addresses long-term drought preparedness because it promotes water conservation and achieves long-term reduction in water use.

#### **References:**

- National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule, Final Rule, FR Vol. 71, No. 2, p 388, January 4, 2006.
- U.S. EPA. Initial Distribution System Evaluation Guidance Manual for the Final Stage 2 Disinfectant and Disinfection Byproducts Rule. Appendix A. January 2006.
- [http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/upload/2006\\_02\\_08\\_disinfection\\_stage2\\_guide\\_idse\\_app\\_a.pdf](http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/upload/2006_02_08_disinfection_stage2_guide_idse_app_a.pdf)
- U.S. EPA. Basic Information about Disinfection Byproducts in Drinking Water: Total Trihalomethanes, Haloacetic Acids, Bromate, and Chlorite. July 2015.
- <http://water.epa.gov/drink/contaminants/basicinformation/disinfectionbyproducts.cfm>

## DIRECT WATER-RELATED BENEFIT TO A DAC

This project provides direct critical water supply and water quality needs of DACs in the region including the following from Table 9 of the 2015 Guidelines:

- Modification of a public water supply system necessary for the system to meet primary drinking water standards
- Infrastructure renovations to a public water supply system necessary to assure continued reliability of the minimum quality and quantity of water

As shown on the Project Map, the seven project tanks are located within a designated disadvantaged community (DAC) and/or provide water service to a DAC area. **More than 25% of the project service area (by geography) serves the need of a DAC as follows:**

According to the US Census Bureau's American Community Survey's (ACS) 5-year compilation of data from 2009-2013, the Colfax, North Auburn and Newcastle Census Places are all classified as DACs with a median household income (MHI) of \$47,175 for Colfax, \$46,939 for North Auburn, and \$45,987 for Newcastle. Both the Colfax and North Auburn DAC Census Places are 77% of the Statewide MHI of \$61,094 while Newcastle DAC is 75% of the Statewide MHI. The state's threshold for a DAC is to have a MHI that is 80% (i.e. \$48,875) or less of the Statewide MHI.

The water quality of the treated water distributed to the DACs identified are impacted by the effects of the drought. The TTHM disinfection byproduct concentrations in the seven tanks identified have either approached or exceeded the MCL of 0.080 mg/L for TTHMs. The percentage of DAC influence was determined geographically by the tank and clearwell area of influence in each water distribution system. The tank and clearwells' area of influence within PCWA's Colfax water distribution system is approximately 2,100 acres; approximately 37% (4,021 acres) of which is designated as a DAC. The tanks' areas of influence within the Auburn/Bowman water distribution system is approximately 16,091 acres; approximately 25% (4,021 acres) of which is designated as a DAC.

Providing high quality treated water to these DACs is important to PCWA and the proposed project will provide a long-term response to these drought-related water quality issues. As mentioned in the Technical Analysis of Physical Benefits Claimed, the tank mixers and ventilation systems have already been installed on two tanks within the Colfax System (Colfax 1 MG and Colfax 0.3 MG) and one distribution system tank (Ball Park/Rising Sun 0.6 MG) which has resulted in a reduction in TTHM levels within the DAC distribution system.

## PROJECT PERFORMANCE MONITORING PLAN

Table 6 – Project Performance Monitoring Plan		
Project: Drought Response Disinfection By-Product Reduction		
Proposed Physical Benefits	Targets	Measurement tools and methods
Primary Benefit: Water Quality Improvement (i.e. reduction in total trihalomethane (TTHM) levels)	less than 0.060 mg/L	Test TTHM levels quarterly at each tank for one year following installation of the mixers and vents. The test will effectively illustrate performance of the mixer and vent since the test will include sampling after a brief period of operation of the tank with the mixer/vent system 'off' to illustrate pre-mixer tank performance. PCWA owns a Parker TTHM Analyzer which will be used by PCWA staff to monitor TTHM levels.
Secondary Benefit: Drinking Water Supply Conservation (i.e. water saved by not draining and filling tanks)	0 gallons	Tank draining and filling is not anticipated. However, if performed, the amount of water required for the operation will be recorded.

To document that the proposed project provides the anticipated water quality and regulatory compliance benefits, PCWA plans to monitor the TTHM concentrations on a quarterly schedule at each tank for one year following installation of the mixers and vents as part of general demobilization testing. The tanks' TTHM monitoring data will verify that performance of the mixers and vents improve water quality. The mixer and vent performance tests will include sampling after a brief period of tank operation with the mixer/vent system 'off' to illustrate pre-mixer tank performance. PCWA owns a Parker TTHM Analyzer, which will be used by PCWA staff to monitor TTHM concentrations at each tank.

In addition, PCWA will continue its routine Stage 2 monitoring at its four locations in the Auburn/Bowman distribution system and one location in the Colfax distribution system on a quarterly basis for compliance with its water system permit.

Distribution pipeline flushing and tank draining and filling is not anticipated. However, if any flushing or tank draining and filling is performed, the amount of water required for the operation will be recorded.

## COST EFFECTIVENESS ANALYSIS

Table 7 – Cost Effective Analysis	
Project name: Drought Response Disinfection Byproduct Reduction Project	
Question 1	<p>Types of benefits provided as shown in Table 5</p> <ol style="list-style-type: none"> <li>1. Water Quality Improvement (i.e. reduction in total trihalomethane (TTHM) levels)</li> <li>2. Drinking Water Supply Conservation (i.e. water saved by not draining and filling the tanks)</li> </ol>
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? <b>Yes.</b>
	If no, why?
	<p>If yes, list the methods (including the proposed project) and estimated costs.</p> <p>1. Manual and automated draining and filling of the tanks within the distribution system was considered. The estimated costs associated with draining and filling the tanks was estimated based on PCWA operations staff availability to perform draining and filling of tanks and to limit the amount of water 'wasted'. PCWA estimates that they would have the staffing capacity to drain and refill the full volume of the seven tanks each month in an effort to remove the stratification within the tanks and improve the water quality. Draining and refilling the seven tanks every month would result in approximately 18.9 million gallons of treated water being wasted each month (7 tanks with a total volume of 18.9 million gallons). At a current Tier 1 Zone 1 rate of \$1.40/unit of water (1 unit = 748 gallons), the cost of water use for tank flushing would exceed \$24,000 per month. This alternative was excluded for further consideration because of the high costs associated with draining and filling tanks. Flushing water alternatives essentially "waste water" and do not meet water conservation measures. Additionally, it is unknown if draining and refilling the tanks on a monthly basis would be adequate to meet the water quality regulations for TTHMs or if an even more frequent draining and refilling schedule would be needed. The flushing alternative total present worth cost amounts to \$6.8 million for a 20-year project life (assuming an interest rate of 4 percent and an escalation rate of 2 percent per year).</p> <p>For comparison, with the preferred alternative (to reduce TTHM levels through mechanical mixing and ventilation systems) the major project costs include labor hours for implementing the program and the direct costs of the tank mixing and ventilation systems equipment and installation. The operation and maintenance cost per year for the project primarily includes the energy use required by the mixing system. The total present worth cost of the preferred alternative is approximately \$2.3 million for a 20-year project life (assuming the tank mixing systems will be running 24 hours a day year-round with energy costs escalated at 4 percent per year and an interest rate of 4 percent).</p> <p>2. PCWA has also attempted to lower TTHM levels by lowering the chlorine disinfectant concentration rates to levels that would still meet residual level requirements within the water distribution system. This method of reducing TTHM levels has not improved the water quality enough to meet PCWA's TTHM concentration maximum target of 0.060 mg/L. Although there are cost savings with this alternative, this method has not proved to be effective at lowering TTHM levels and therefore does not provide the same level of physical benefits.</p>
Question 3	<p>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.</p> <p><b>The proposed project is the least cost alternative over the life of the project.</b></p>
Comments:	